REMARKS/ARGUMENTS

By this Amendment, claims 1, 2, 5, 6 and 15 are amended and claims 3, 4 and 10-14 are canceled. Claims 10-14 were previously withdrawn from consideration pursuant to a restriction requirement and are now canceled without prejudice to filing of divisional or other continuing applications. Claims 1-2, 5-9 and 15 are pending.

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

THIRD SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT FILED 2/15/05:

A Third Supplemental Information Disclosure Statement (IDS) was properly filed by the applicant on February 15, 2005. This IDS included one foreign reference. A copy of that reference was provided. This Third Supplemental IDS, including a copy of the reference was received by the Office as evidenced by the scanned documents appearing on the Office's PAIR system, but was never signed-off on by the Examiner. It is respectfully requested that the Examiner consider the document listed on this Third Supplemental IDS and sign off as appropriate.

SUMMARY OF THE CHANGES TO THE CLAIMS:

Claims 3 and 4 are canceled. The subject matter of previous Claims 3 and 4 has been incorporated into amended claim 1. Claim 6 is amended to add the density of the wear layer. Claim 15 is amended to make the nature of the core layer explicit. Applicant cancels nonelected

claims 10-14, reserving his rights under 35 USC § 121 to file a divisional application or other continuing application based on the nonelected claims.

With respect to the brake discs of the invention, they relate to brake discs which have a composite structure wherein a wear face is secured to a core layer. This is distinct from a unitary structure in which the core and wear surfaces are formed unitarily in a single operation.

REJECTION UNDER 35 U.S.C. § 102(b):

The Examiner first rejected claims 1, 2, 3 and 15 under 35 U.S.C. § 102(b) as being anticipated by GB 2298687 (Fennel). Fennel does not disclose a structure in which a wear layer is attached to a face portion of a core layer. Rather, the core layer and wear layer are laid-up together in a single operation (see pages 11 to 13). Additionally, the central core layer in Fennel is not a C-C composite impregnated with a refractory carbide. Finally, there is no mention in Fennel of the wear layer having a lower density than the core layer.

Therefore, there can be no anticipation of the subject matter of amended claim 1 by Fennel. Since claim 2 depends from claim 1, claim 2 is also believed to be allowable. Claim 3 is canceled. It is respectfully requested that the Examiner withdraw the rejection under 35 U.S.C. § 102 for anticipation by Fennel.

The Examiner also rejected claims 1, 2, 3 and 15 under 35 U.S.C. § 102(b) as being anticipated by U.S Patent No. 6,057,022 (Purdy). Purdy simply discloses methods of chemical vapor infiltration to obtain a C/C structure having varying degrees of densification in a unitary structure. As stated at lines 63-65 of column 8 of Purdy, a symmetrical density gradient is desirable for brake disk applications. As is clear, this passage relates to the embodiment

described in Figure 9 which shows a face 80 which has a higher density than the core layer.

Moreover, there is no disclosure in Purdy of providing a C-C core layer which is impregnated with a refractory carbide, as is explicitly required in amended claim 1.

Therefore, there is also no anticipation of the subject matter of claim 1 by the teachings of Purdy. Again, claim 2 depends from claim 1 and claim 3 is canceled. It is therefore respectfully requested that the Examiner withdraw the rejection under 35 U.S.C. § 102 based on Purdy and pass claims 1 and 2 to allowance.

REJECTION UNDER 35 U.S.C. § 103:

The Examiner next rejected claims 1-9 and 15 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,042,935 (Krenkel) or U.S. Patent Application No. 2003/0057040 (Bauer) or U.S. Patent No. 6,221,475 (Domergue) or U.S. Patent Application No. 2002/0068164 (Martin) in view of Fennell or Purdy or U.S. Patent No. 6,079,475 (Dietrich). With respect to the claims, as amended, which now include claims 1-2 and 5-9, this rejection is traversed in that it is now moot in the light of the amendment made herewith for the reasons set out below.

As stated above, each of Purdy and Fennel suffer from a plurality of deficiencies in relation to the amended claim 1. These deficiencies are not remedied by the cited art.

Turning first to Dietrich, this document does not relate to an aircraft brake heat pack but rather to a brake unit for a motor vehicle or the like which comprises a brake disk and a brake lining in the form of a brake pad which frictionally (*i.e.*, tribologically) interact during a braking

event. As is known to one skilled in the art, and as is accepted in Dietrich, this is distinct from an aircraft heat pack.

In Dietrich, the brake disc is a C-C structure which is infiltrated with silicon to provide a SiC infiltrated C-C structure. However, the structure is homogeneous (see line 14 of column 4) with a constant density of 2.25 gcm^{-3}.

There is no disclosure of a brake disc for an aircraft in Dietrich. Also, there is no disclosure of a brake disc having a C-C wear face which is of lower density than a refractory carbide impregnated C-C core layer to which it is attached.

Krenkel shows, in Figure 2, a multiple brake system that can be used in aircraft (see lines 31 to 32 of column 5). As stated (see lines 13 to 41 of column 8), each stator and rotor is comprised of a core body 1 and friction bodies 2. The friction bodies 2 are formed:

> ". . . from a carbon fiber-reinforced, porous carbon body which is infiltrated with fluid silicon to form an extremely dense material surface, especially one with a dense surface."

(see lines 12 to 14 of column 7)

The core body 1 is similarly made from a carbon material impregnated with silicon (see lines 58 to 61 of column 5).

It is an essential feature of Krenkel that the friction surface comprises silicon and silicon carbide (see lines 4 to 9 of column 1 and claim 1) and that the density of the wear surface will be equal to or greater than that of the core layer.

There is no incentive for a person skilled in the art to alter the teaching of Krenkel to arrive at the present invention, as claimed. If a person skilled in the art were to combine the

teaching of Krenkel with any of Purdy, Fennel or Dietrich, the person skilled in the art would be taught nothing other than that by providing a silicon infiltrated C-C wear layer, one can provide a wear layer capable of withstanding temperatures of up to 2000°C. (see lines 14 to 15 of column 7 of Krenkel). Thus, Krenkel would not remedy the deficiencies in the other cited art and would not lead to the claimed invention. In fact, Krenkel would lead away from the claimed invention because it would encourage the person skilled in the art to provide a silicon infiltrated wear layer.

Bauer, at paragraph 0009, states that brake discs having different core regions and wear layers are not known. It goes on to disclose that it is important to control the amount of silicon and silicon carbide in the wear layer (the friction surface).

It is an essential feature of Bauer that the brake disc has a SiC content of more than 65%, a silicon content of less than 25%, the remainder being carbon (see paragraph 0013). In particular, the SiC content of the support zone (*i.e.*, the core layer – see paragraph 0006) is less than that of the wear layer (*i.e.*, the frictional body – see paragraph 0006) as disclosed at paragraph 0016.

It is well known that SiC has a higher density than carbon. Accordingly, it is the clear and explicit teaching of Bauer that the wear layer should, and indeed must, have a higher density than the core layer.

Accordingly, the person skilled in the art that is provided with one of Purdy, Fennel or Dietrich in the light of Bauer, alone or in combination, would not be provided with the incentive to modify the prior art such that it would teach the subject matter of claim 1, as amended.

In fact, Bauer actually teaches in the opposite direction from the claimed invention, insofar as that Bauer maintains that it is essential to ensure that the wear surface is of a higher density to the core layer and to ensure that the wear layer has a high SiC content. Clearly, provided with Bauer, the person skilled in the art would look to provide high amounts of SiC in the wear layers of Purdy, Fennel or Dietrich, to provide a relatively high density wear layer, in contradistinction to the teaching of amended claim 1.

It is noted that Domergue does not relate to the provision of brake discs for aircraft (see lines 1 to 6 of column 2). It is also noted that the friction face of the discs of Domergue have a large amount of silicon carbide and silicon (up to 60%). Indeed, as stated in the paragraph bridging columns 3 and 4 of Domergue:

> ". . . .the core of the disc can be made, at least in part out of a composite material in which the matrix does not have a silicon carbide phase."

The lack of silicon carbide in the core provides, according to Domergue, certain mechanical advantages such as lower stiffness.

It is stated in Domergue that the infiltration with silicon can be arranged to extend throughout the volume of the disk or can occur just at and through the wear layer (see lines 15 to 19 of column 9).

Again, as is readily and obviously apparent to the person skilled in the art, Domergue is concerned with the provision of a brake disc in which the wear or friction layer has a higher density than the core layer and that the wear layer should have silicon carbide phase.

Clearly, provided with the teaching of Domergue, the person skilled in the art would either dismiss it because it does not relate to aircraft heat packs or, even if it were to be

considered, would understand that it requires a brake disk to be formed with a silicon carbide phase in the friction face of wear layer. This teaching clearly and unambiguously runs in contradistinction to the subject matter of claim 1.

Martin discloses a friction body having a core 8 and friction layers 9, 10. The friction body is not suitable for use as an aircraft heat pack brake disc. In any case, the friction layers and core are both infiltrated with silicon (see paragraph 0010).

It is also stated that the friction layers and core body are formed from similar materials, that is, C-C infiltrated with silicon (see paragraph 0021, 0025 and 0027). The only difference between the friction layer and the core layer is the lengths of the carbon fibers used.

Therefore, provided with Martin, the skilled person would either dismiss the teaching as being irrelevant to aircraft heat pack brake discs or would understand the teaching to exclusively relate to the provision of a brake disc in which the wear or friction surface must be infiltrated with silicon but should be formed from shorter carbon fibers than the core region. Again this runs in contradistinction to the invention as defined in amended claim 1.

Clearly, in the light of the amendments to claim 1, the prior art relied upon by the Examiner neither renders the subject matter of claim 1 anticipated or obvious. The Examiner's assertion that it would have been obvious to have modified the prior art is simply not borne out by any analysis. As stated above, none of the primary references teaches the use of different compositions in brake discs or indeed the use of wear layers to be attached to core layer.

The secondary references do not remedy the deficiency because they all relate to the provision of refractory carbide-impregnated wear faces and not to plain C-C composite wear

faces, as is required in claim 1, as amended. The only way in which the invention can be considered obvious is by working backwards from the invention as claimed, using hindsight. As is well established, the indulgence of hindsight analysis of an invention is not allowed. See, for example, *In re Fritch*, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992).

Claims 2 and 5 to 9 are dependent on claim 1 and are therefore also believed to be patentable.

The subject matter of claim 15 is amended to include the feature that the core layer is a C-C composite impregnated with refractory carbide. As is well known to a person skilled in the art, and as stated in the application in suit, C-C composites have a density of 1.85 gcm^{-3} or lower, and refractory carbides have higher densities. None of the prior art, for the reasons given above, discloses or foreshadows such subject matter. Accordingly, it is submitted that the invention, as defined in claim 15, is also novel and not obvious over the prior art of record.

In particular, the inventive nub of the current invention revolves around the appreciation that by using a refractory carbide impregnated core layer with a C-C composite wear layer, the overall length of a heat pack can be reduced whilst not compromising performance. None of the prior art documents addresses this issue, even in the most oblique sense.

Whilst it may be true that a person skilled in the art may wish to reduce weight, he or she would not do so if the result compromised efficiency.

The prior art relied upon by the examiner seeks to improve the stability (*e.g.*, oxidation resistance) of the wear faces of brake discs. Clearly, this is to be conducted in spite of any weight gain or deleterious effect on braking performance. This indicates that the person skilled

in the art presented with the prior art of record would not consider the invention as claimed to be obvious. Any such finding of obviousness can only be as a result of ex post facto analysis of the invention. Again, this demonstrates that the Examiner is employing ex post facto reasoning in her analysis of the invention.

With regard to the Examiner's objection to the word "core," it is respectfully asserted that the reasoning is flawed. In claim 1, the 'core layer' has a 'face portion' to which the 'wear layer' is attached. This is only understood by the person skilled in the art (to whom the specification is directed) as stating that the core layer provides a support across its width for the wear layer. The person skilled in the art has no difficulty interpreting the language used. Even if, which is not admitted, there was an issue of interpretation, the person skilled in the art need only to refer to the description in relation to Figure 2.

It is of note that most of the prior art documents relied upon by the examiner use similar language which is, at the very least, indicative of the dictionary employed by the person skilled in the art.

For at least the reasons set forth above, it is respectfully submitted that the above-identified application, as amended, is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1, 2 and 5-9 are respectfully requested.

Should the Examiner believe that anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,

CAESAR, RIVISE, BERNSTEIN,
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May 3, 2006

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Please charge or credit our Account No. 03-0075 as necessary to effect entry and/or ensure consideration of this submission.